

University of Minnesota Nano Fabrication Center

Standard Operating Procedure

Equipment Name: Gaertner ellipsometer

Coral Name: ellipsometer-g

Revision Number: 2

Model: L116A

Revisionist: K.Burkland

Location: Bay 1

Date: 10/29/03

1 **Description**

Ellipsometry is a non-destructive method of measuring the index of refraction and film thickness of a dielectric film on a reflecting substrate. It is a highly accurate and repeatable measurement.

Ellipsometry involves illuminating the surface of a sample with monochromatic light having a known and controllable state of polarization and analyzing the polarization state of the reflected light.

2 **Safety**

a Avoid eye contact with the laser to prevent eye damage.

3 **Restrictions/Requirements**

- a Must be a qualified user
- b The substrate can not be transparent.

4 **Required Facilities**

5 **Definitions**

6 **Setup**

- a Wake up the computer by moving the mouse or pressing the space bar.
- b If the application is not open, click on the icon labeled 'Ellipsometer'.
- c Select the 'continue' button on the next two screens.
- d Single click on the menu icon which depicts the ellipsometer.

7 **Operating Instructions**

- a Place the sample in the middle of the stage with tweezers.
- b For fine positioning, adjust the X – Y micrometers located to the left and also the front of the stage.
- c For gross positioning, move the wafer to a new location on the stage.
- d Pull the laser shutter outward on the laser tube located left of the stage.
- e Move the Mode analyzer switch, located on the right, to the AS position.
- f Adjust the stage height by loosening the stage set screw located in the front. Rotate the height adjustment dial located at the rear of the stage until the meter display is maximized.
- g The gain may need to be adjusted to see any response. Keep the gain below 125 to avoid saturation. Tighten the set screw when complete.
- h Rotate the analyzer dial until the display is maximized keeping the response below 125 to avoid saturation.
- i Adjust the gain control knob to an output reading of 75.
- j Move the mode analyzer switch, located on the right, to the A position.
- k Select 'Load New Setup File' button on the computer.

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- l Choose the appropriate recipe. If no recipe can be found for the film type you are working on, choose a similar recipe. Any of the recipes can be modified to suit you particular film and saved as a new file.
 - m Choose an appropriate calculation mode. The usual is Thickness1 and Nf1 which is Thickness and Refractive Index.
 - n Select the 'Measure and Calculation' button.
 - o To view the periodical solution set of the thickness, single click on the "I Listing' button. The data will be displayed on the window behind the 'Measurement and Calculation' window. Subsequent solution sets of data can also be added to this window. To save the accumulated data you will have to close the Measurement and Calculation' window (the data in 'Measurement and Calculation' will be lost) and then perform a 'Save As' command from the File menu.
 - p To continue making measurements restore the 'Measurement and Calculation' window by single clicking on the icon which depicts the ellipsometer.
 - q When the measurements are complete, close the laser shutter.
- 8 Problems/Troubleshooting**
- a If the sample is not flat enough, it is necessary to adjust the gain while taking the measurements over the samples surface.

